

Load Impact Evaluation: *Base Interruptible Program*

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Presentation Outline

1. Program Description
2. *Ex-post* Methodology
3. *Ex-post* Load Impacts
4. *Ex-ante* Methodology
5. Enrollment Forecast
6. *Ex-ante* Load Impacts

1. BIP Program Description

- ❑ Emergency DR program for non-residential customers, events triggered by CAISO or local system emergencies
- ❑ Customers receive a monthly capacity credit in exchange for a commitment to reduce energy consumption to their Firm Service Level (FSL)
- ❑ The FSL represents the customer's minimal operational requirements
- ❑ 30-minute notice of events (also a 15-minute option at SCE)
- ❑ Failure to reduce load to the FSL can result in excess energy charges, an increase in the FSL (and commensurate reduction in capacity credits), re-test events, or de-enrollment from the program

2. *Ex-post* Methodology

- ❑ Individual regressions were used to estimate BIP *ex-post* load impacts
- ❑ Customer-specific specification search conducted to:
 - Determine whether each customer has a weather-sensitive load
 - Find the best fitting weather and shape variables by groups defined by weather sensitivity and industry group
- ❑ This method was chosen for two reasons:
 - Difficulty in finding adequate control-group customers
 - Some customers have volatile loads, so even customers that match reasonably well on average may not have a comparable load on a specific day

3. *Ex-post* Load Impacts: Events

Date	Day of Week	PG&E	SCE	SDG&E
5/3/2017	Wednesday	Emergency Event, 8:00-9:25 p.m.	Emergency Event, 6:58-9:18 p.m.	
7/11/2017	Tuesday	Re-test, 6:00-8:00 p.m.		
8/31/2017	Thursday			Test, 11:00 a.m.-3:00 p.m.
10/17/2017	Tuesday	Re-test, 6:00-8:00 p.m.		

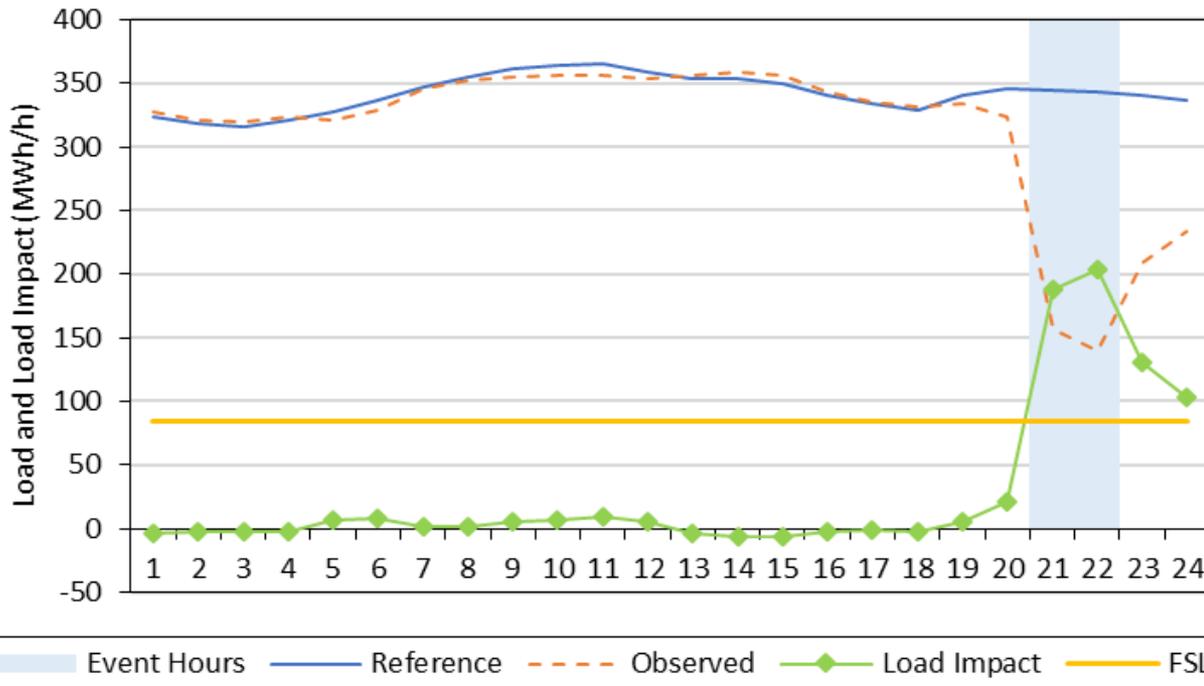
Notes:

- Re-test event impacts are not presented due to confidentiality concerns (few customers were called).
- No events were called on utility or CAISO peak days. The PG&E, SDG&E, and CAISO peak day was 9/1/2017. The SCE peak day was 8/30/2017.

3. *Ex-post* Load Impacts: Events (2)

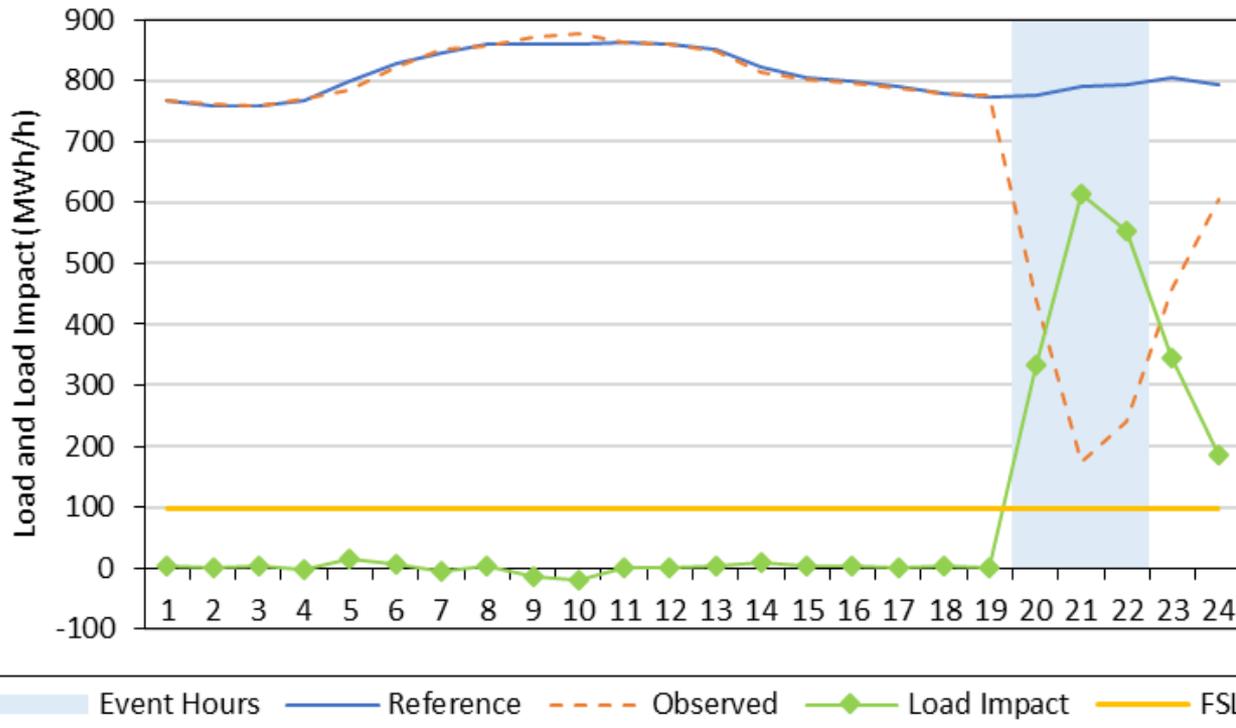
Utility	Hours of Availability	Hours of Actual Use	No. of Available Dispatches	No. of Actual Dispatches
PG&E	180 / year 4 / day	5.5	10 / month 1 / day	3
SCE	180 / year 6 / day	2.5	10 / month 1 / day	1
SDG&E	120 / year 4 / day	4	10 / month	1

3. Ex-post Load Impacts: PG&E May 3rd Event



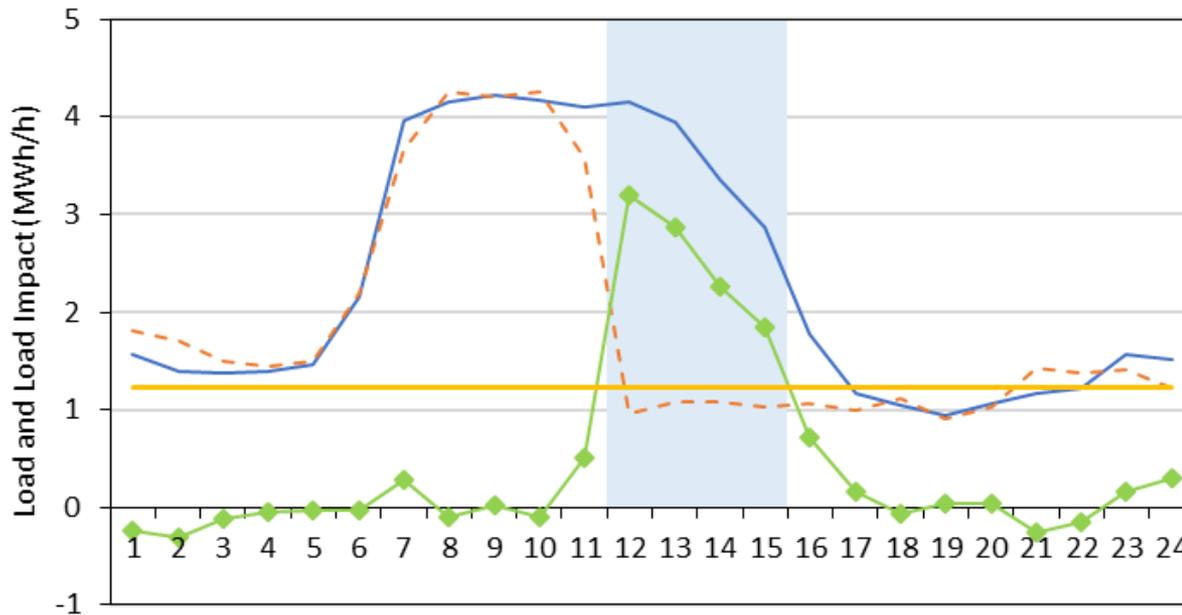
- Event from 8:00 to 9:25 p.m.
- 331 enrolled customers
- Avg. Ref. Load = 344 MW
- Avg. Load Impact = 195 MW
- FSL = 85 MW
- % Load Impact = 57%
- FSL Achievement = 75%
- Top 10 responders account for 46% of the total load impact

3. Ex-post Load Impacts: SCE May 3rd Event



- Event from 6:58 to 9:18 p.m.
- 571 enrolled customers
- Avg. Ref. Load = 790 MW
- Avg. Load Impact = 615 MW
- FSL = 98 MW
- % Load Impact = 78%
- FSL Achievement = 89%
- Top 10 responders account for 33% of the total load impact
- Values above represent the only full event hour, from 8 to 9 p.m.

3. Ex-post Load Impacts: SDG&E August 31st Event



- Event from 11 a.m. to 3 p.m.
- 6 enrolled customers
- Avg. Ref. Load = 3.6 MW
- Avg. Load Impact = 2.5 MW
- FSL = 1.2 MW
- % Load Impact = 71%
- FSL Achievement = 108%
- 3 of 6 customers accounted for virtually all of the load impact

4. *Ex-ante* Methodology

- ❑ *Ex-ante* load impacts are based on the most recent full or test / M&E event day, by customer (some PG&E customers were re-tested)
- ❑ Each customer's *ex-ante* load impact is set to its *ex-post* FSL achievement rate:
 - $ExPost \text{ Achievement} = ExPost \text{ Load Impact} / (\text{Ref.} - \text{FSL})$
 - $ExAnte \text{ Impact} = ExPost \text{ Achievement} \times (\text{Ref.} - \text{FSL})$
- ❑ Load impact is zero if FSL is above the reference load
- ❑ We remove customers who have left BIP
- ❑ Customers who have joined BIP are assigned the program-level FSL achievement rate (applied to their own reference loads and FSL, if available)

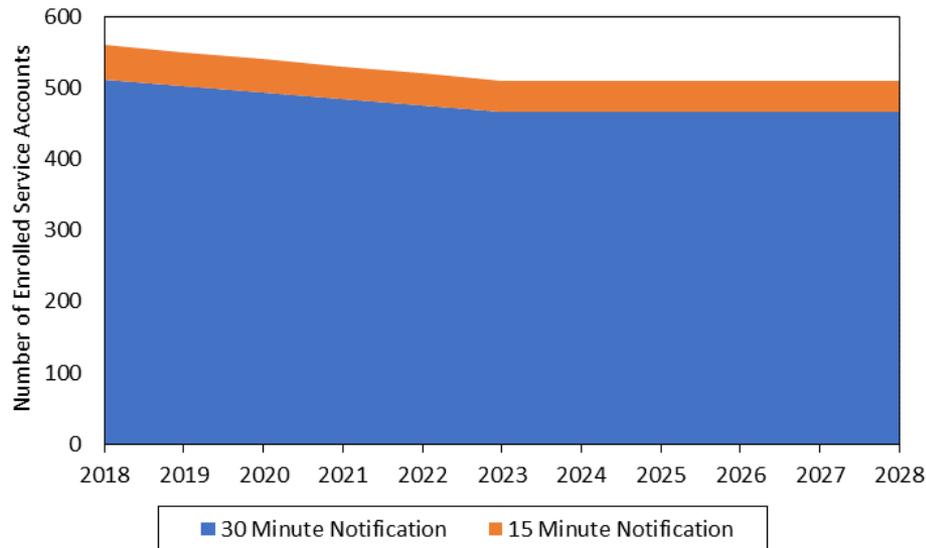
4. *Ex-ante* Methodology (2)

- ❑ Reference loads are simulated using the following:
 - Customer-specific regressions to obtain effect of weather and time-period indicators on usage
 - *Ex-ante* day types and weather conditions (*e.g.*, August peak month day in a utility-specific 1-in-2 weather year)
- ❑ Load impacts display little to no relationship with weather conditions
 - Biggest responders do not tend to have weather-sensitive loads

5. Enrollment Forecast

❑ PG&E: 362 customers from 2018 through 2028

❑ SCE



❑ SDG&E: increase by one customer each year until 2022, then remain constant through 2028

6. Ex-ante Load Impacts: by Year and Weather Scenario

	Year	Weather	# SAIDs	Load Impact (MW)	Temp. (°F)	FSL (MW)
PG&E	Aug. All Years	PG&E 1in2	362	220.6	95.9	75.5
		PG&E 1in10		222.4	99.3	

	Year	Weather	# SAIDs	Load Impact (MW)	Temp. (°F)	FSL (MW)
SCE	Aug. 2018	SCE 1in2	560	648.1	93.0	106.4
		SCE 1in10		650.2	96.1	
	Aug. 2028	SCE 1in2	510	588.7	93.0	97.0
		SCE 1in10		590.6	96.1	

	Year	Weather	# SAIDs	Load Impact (MW)	Temp. (°F)	FSL (MW)
SDG&E	Aug. 2018	SDG&E 1in2	7	1.3	88.6	1.4
		SDG&E 1in10		1.3	93.1	
	Aug. 2028	SDG&E 1in2	11	2.0	88.6	2.2
		SDG&E 1in10		2.0	93.1	

6. *Ex-ante* Load Impacts:

PG&E Ex Post vs. Ex Ante

Ex Post / Ex Ante	Date / Scenario	# SAIDs	Reference Load (MW)	Load Impact (MW)	Temp. (°F)	FSL (MW)	FSL Achievement
Ex Post	5/3/2017	331	344	195.4	78	84.5	75%
Ex Ante	Aug. 2018 Typical Event Day	362	309	220.5	96	75.5	95%

- Though enrollment increases, the total reference load is expected to go down
 - Change in customer composition explains this
 - Fewer large (200kW+) customers, more SMB customers
 - The share of large customers is forecast to go down from 77% to 68%
- The higher *ex-ante* FSL achievement is because the analysis takes performance during re-test events into account

6. *Ex-ante* Load Impacts:

SCE Ex Post vs. Ex Ante

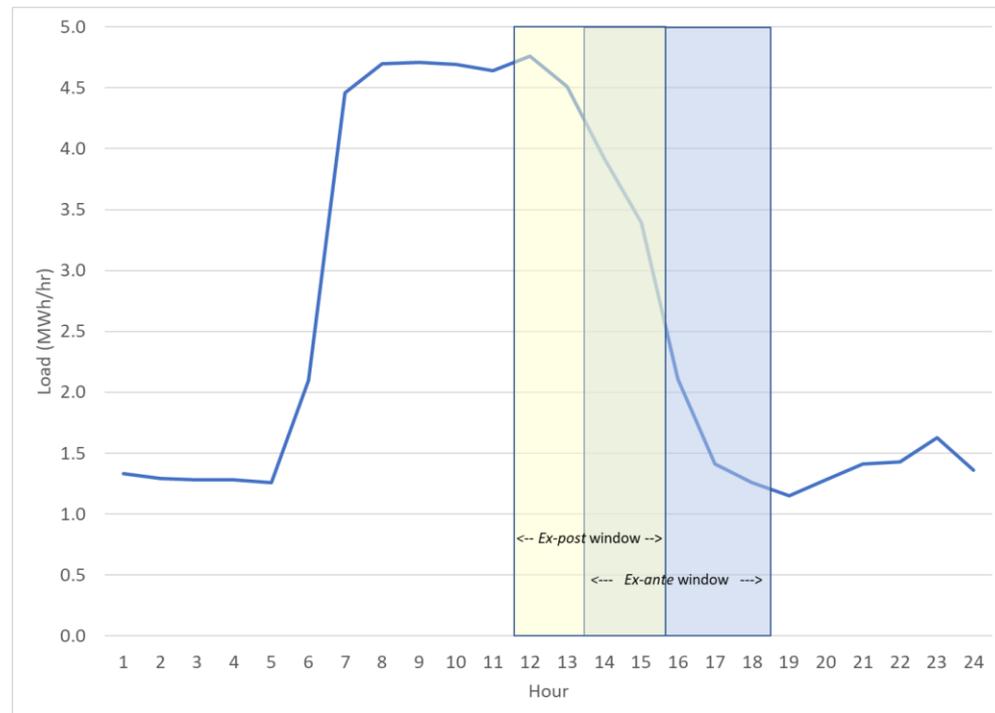
Ex Post / Ex Ante	Date / Scenario	# SAIDs	Reference Load (MW)	Load Impact (MW)	Temp. (°F)	FSL (MW)	FSL Achievement
Ex Post	5/3/2017	571	790	615	74	98	89%
Ex Ante	Aug. 2018 Typical Event Day	560	834	644	90	106	89%

- Relatively small differences between *ex-post* and *ex-ante* load impacts

6. Ex-ante Load Impacts: SDG&E Ex Post vs. Ex Ante

Ex Post / Ex Ante	Date / Scenario	# SAIDs	Reference Load (MW)	Load Impact (MW)	Temp. (°F)	FSL (MW)	FSL Achievement
Ex Post	8/31/2017	6	3.6	2.5	94	1.2	108%
Ex Ante	Aug. 2018 Typical Event Day	7	2.4	1.3	90	1.4	130%

- Differences are primarily due to program load dropping off in the middle of the RA window
 - Ex-post* event hours = HE 12 to 15 (11 a.m. to 3:00 p.m.)
 - Ex-ante* RA window = HE 14 to 18 (1 to 6 p.m.)
- As a result, there's a lot less load to curtail during the RA window
- The higher FSL achievement is due to some customer-specific reference loads falling below their FSL



6. Ex-ante Load Impacts:

PG&E, Previous vs. Current Aug. 2018 Forecast

When Created	# SAIDs	Aggregate			Per-customer	
		Reference Load (MW)	Load Impact (MW)	FSL (MW)	Reference Load (kW)	Load Impact (kW)
Following PY2016 (Previous)	330	387	300.1	87.5	1,172	910
Following PY2017 (Current)	362	309	220.5	75.5	853	609

- The current forecast has more customers, but some large customers left the program and comparatively small customers joined
- The lower per-customer reference loads and load impacts reflect the change in customer composition

6. Ex-ante Load Impacts:

SCE, Previous vs. Current Aug. 2018 Forecast

When Created	# SAIDs	Aggregate			Per-customer	
		Reference Load (MW)	Load Impact (MW)	FSL (MW)	Reference Load (kW)	Load Impact (kW)
Following PY2016 (Previous)	619	838	658.1	104.1	1,354	1,063
Following PY2017 (Current)	560	834	644.3	106.4	1,490	1,151

- Forecast enrollment has declined, leading to a reduction in load impacts
- The per-customer load impact increased slightly across forecasts

6. Ex-ante Load Impacts:

SDG&E, Previous vs. Current Aug. 2018 Forecast

When Created	# SAIDs	Aggregate			Per-customer	
		Reference Load (MW)	Load Impact (MW)	FSL (MW)	Reference Load (kW)	Load Impact (kW)
Following PY2016 (Previous)	8	9.2	6.1	3.2	1,154	766
Following PY2017 (Current)	7	2.4	1.3	1.4	341	179

- The previous forecast had an additional customer that was very large compared to the customers in the current forecast

Questions?

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